

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 22 AUG 2005

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| Applicant's or agent's file reference PC0052 | | FOR FURTHER ACTION | | See Form PCT/IPEA/416 |
| International application No. PCT/IB2004/001948 | | International filing date (day/month/year) 11.06.2004 | | Priority date (day/month/year) 13.06.2003 |
| International Patent Classification (IPC) or national classification and IPC B05B12/06, A01G25/16 | | BEST AVAILABLE COPY | | |
| Applicant DRECHSEL, Arno | | | | |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 8 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> | | | | |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p> | | | | |
| Date of submission of the demand 13.01.2005 | | Date of completion of this report 18.08.2005 | | |
| Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 | | Authorized Officer Thanbichler, P Telephone No. +49 89 2399-8957 | | |



INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/IB2004/001948

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1, 4-9 as originally filed
2, 2a, 3, 10 filed with telefax on 13.04.2005

Claims, Numbers

1-20 filed with telefax on 13.04.2005

Drawings, Sheets

1/4-4/4 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/B2004/001948

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|--------------------|
| Novelty (N) | Yes: Claims | 3-8,12-13,15-18,20 |
| | No: Claims | 1-2,9-11,14,19 |
| Inventive step (IS) | Yes: Claims | 3-8,12-13,15-18,20 |
| | No: Claims | 1-2,9-11,14,19 |
| Industrial applicability (IA) | Yes: Claims | 1-20 |
| | No: Claims | - |

2. Citations and explanations (Rule 70.7):

see separate sheet

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

PCT/IB2004/001948

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

Reference is made to the following document:

D1: US-A-4 314 669 (MOOS KURT) 9 February 1982 (1982-02-09)

2 INDEPENDENT CLAIM 1

- 2.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.
Document D1 discloses (the references in parenthesis applying to this document):

A vacuum generating device which comprises a duct extending along a longitudinal axis for the passage of a main pressurized fluid, said longitudinal duct having an inlet portion, an outlet portion and a restricted portion located therebetween and adopted to generate a vacuum by Venturi effect, a first radial conduit in fluid communication with said restricted portion and at least one second radial conduit in fluid communication with said restricted portion and with the outside (fig. 2; col. 3 line 32-col. 4 line 13), said first radial conduit has a connecting port (fig. 2), said device further has a central chamber being provided to put said first and said second radial conduits in fluid communication with each other and with the restricted portion (*the portion of channel 28 between lying between duct 33 and duct 34 in figure 2 of D1 can be regarded as central chamber connecting said two ducts with the restricted portion*).

The formulation "...particularly for..." has no limiting effect on the scope of the claim. The feature following any such expression is to be regarded as entirely optional (Guidelines C-III, 4.6 and 4.8a).

3 DEPENDENT CLAIMS 2,9-11,14,19

Dependent claims 2, 9-11, 14 and 19 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

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of the PCT in respect of novelty and/or inventive step (Article 33(2) and (3) PCT).

4 DEPENDENT CLAIMS 3-8,12-13,15-18,20

The combination of features of dependent claims 3-8,12-13,15-18 and 20 are neither disclosed nor rendered obvious by the available prior art and could serve as a basis for a new allowable independent claim.

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AMENDED CLAIMS

1. A vacuum generating device, particularly for operating actuator members
5 in fluid delivery systems, which device comprises a duct (3) extending along a
longitudinal axis (L) for the passage of a main pressurized fluid, said longitudinal
duct (3) having an inlet portion (4), an outlet portion (5) and a restricted portion (6)
located therebetween and adapted to generate a vacuum by Venturi effect, a first
radial conduit (7) in fluid communication with said restricted portion (6), at least
10 one second radial conduit (9), in fluid communication with said restricted portion
(6) and with the outside, characterized in that said first radial conduit (7) has at
least one connecting port (8) for connecting with one or more external actuator
members (2), a central chamber (20) being provided to put said first and said
second radial conduits (7, 9) in fluid communication with each other and with said
15 restricted portion (6).

2. Device as claimed in claim 1, characterized in that said second radial
conduit (9) has an orifice (10) which is designed to change the pressure in said
first (7) and said second (9) radial duct and also the flow conditions in said outlet
20 portion (5).

3. Device as claimed in claim 2, characterized in that said orifice (10) is in
fluid communication with the outside environment at atmospheric pressure.

25 4. Device as claimed in claim 3, characterized in that said inlet portion (4) is
formed within a main body (11), and said outlet portion (5) is formed within a
tubular member (12).

5. Device as claimed in claim 4, characterized in that said inner diameter
30 (D_R) of the restricted portion (6) is smaller than the inside diameters (D_i , D_o) of the
inlet portion (4) and the outlet portion (5) respectively, said main body (11) and
said tubular member (12) being connected with each other so that said inlet (4),

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outlet (5) and restricted (6) portions are aligned along said longitudinal axis (L).

6. Device as claimed in claim 5, characterized in that said central body (11) comprises a hollow seat (13) which is adapted to house a connecting portion (14) of said tubular member (12).

7. Device as claimed in claim 6, characterized in that said connecting portion (14) of said tubular member (12) has external threads (15) for engagement in corresponding internal threads (16) on said hollow housing (13) of said main body (11).

8. Device as claimed in claim 6, characterized in that it comprises a sealing ring (17) between said main body (11) and said tubular member (12), which is positioned at a peripheral edge (18) of said hollow seat (13).

15

9. Device as claimed in claim 4, characterized in that said first and said second radial conduits (7, 9) are formed within said main body (11).

10. Device as claimed in claim 9, characterized in that said first and said second radial conduits (7, 9) substantially extend along a common geometrical plane, which is orthogonal to said longitudinal axis (L).

20

11. Device as claimed in claim 10, characterized in that said first and said second radial conduits (7, 9) are disposed along a common transverse axis (T), on opposite sides of said longitudinal axis (L).

25

12. Device as claimed in claims 6 and 9, characterized in that a longitudinal end (19) of the connecting portion (14) is positioned at a relatively small axial distance from said restricted portion (6) to receive the main pressurized fluid therefrom.

30

13. Device as claimed in claim 12, characterized in that said central

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chamber (20) is an annular space between the longitudinal end (19) of the connecting portion (14) of said tubular member (12) and the bottom surface (21) of said hollow seat (13) of said main body (11).

5 14. Device as claimed in claim 3, characterized in that it includes means for closing said orifice (10) of said second radial conduit (9), which are adapted to change the size of the orifice (10) and/or to selectively close it off.

10 15. Device as claimed in claim 14, characterized in that said closing means include a valve that is electrically controlled by a control unit.

15 16. Device as claimed in claim 2, characterized in that it comprises attachment means (23) for securing a connecting line (22) to one or more actuator members (2), said attachment means (23) being positioned at said connecting port (8) of said first radial conduit (7).

20 17. Device as claimed in claim 1, characterized in that it comprises a plurality of radial conduits (7', 7'', ...) in fluid communication with said restricted portion (6) and with the outside, each radial conduit (7', 7'', ...) of said plurality being substantially like said first radial conduit (7) and angularly staggered with respect to it.

25 18. Device as claimed in claim 17, characterized in that each radial conduit (7', 7'', ...) of said plurality has at least one respective connecting port (8', 8'', ...) for transmitting said negative pressure to a plurality of external actuator members (2', 2'', ...), the pressure in each of said radial conduits (7', 7'', ...) being controllable by a respective valve or appropriate adjustment means.

30 19. Device as claimed in claim 1, characterized in that said first (7) and/or said second (9) radial conduit have at least one respective suction port (8, 10) for the passage of one or more secondary fluids which are designed to be mixed with the main fluid at said restricted portion (6).

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20. An assembly for operating an irrigation system, comprising at least one actuator member (2, 2', 2'',...) adapted to displace one or more movable elements of said system by predetermined movements, characterized in that it comprises a
s vacuum generating device (1) according to one or more claims 1 to 19 connected to said actuator member (2, 2', 2'', ...) by a respective connecting line (22, 22', 22'',...).

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Operating devices are further known which are used to control liquid delivery in irrigation systems, and include a Venturi device capable of generating an appropriate negative pressure.

- 5 Particularly, US-A-4900189 discloses an operating device for pulsed and automatic delivery of an irrigation liquid, which includes a Venturi device fed with the irrigation liquid. The device comprises a liquid inlet duct, a liquid outlet duct and an auxiliary duct having an end at the restricted section of the Venturi device. By this arrangement, the auxiliary duct transmits the negative pressure generated
10 by the Venturi device to a sliding piston, which is capable of reciprocating and of selectively preventing the passage of liquid from the inlet duct to the outlet duct, as well as of selectively opening a vent to the atmosphere.

- During operation, when the liquid passes from the inlet duct to the outlet duct, the
15 negative pressure generated by the Venturi device keeps the piston in a first position liquid wherein the fluid passage is open and the vent is closed. As pressure increases upstream from the operating device and the flow is accordingly reduced, the pressure in the auxiliary duct also increases until it causes the piston to move to a second position in which liquid flow is stopped and atmospheric
20 pressure is introduced in the auxiliary duct. The abrupt pressure drop in the auxiliary duct brings the piston back to the first position and a new pulsed cycle is initiated.

- A drawback of this solution is that the piston may be only displaced upon a change
25 of the conditions of the liquid upstream of the operating device, and an operator cannot operate the piston directly by a manual or remote control. Furthermore, the sequence of piston movements is rigidly determined by the geometric design of the control device and by the characteristics of the irrigation system upstream from the device. Particularly, the sequence of movements may not be changed as
30 desired, to fit different applications.

US-A-4314669 discloses a method and apparatus for spraying a granular bulk

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material, mixed with a stream of propellant gas, on the surface of an article. This known apparatus, on which is based the preamble of the attached claim1, comprises a control device with a first primary channel in fluid communication with a secondary longitudinal duct through a first radial conduit. The mixture normally
5 flows in the primary channel while the secondary duct is designed for drawing the mixture from the primary channel.

The secondary duct has an inlet portion, an outlet portion and a restricted portion located therebetween and adapted to generate a vacuum by Venturi effect, while
10 the first radial conduit is in fluid communication with the restricted portion.

When it is desired to interrupt the spray process, for example during the changes of the article, a pressurized fluid stream is turned on and passes in the secondary duct, drawing up the mixture via the first radial conduit and recycling it to a storage
15 container.

It is noticed that the device comprised in this apparatus does not serve to actuate an operating machine of the type used e.g. in irrigation systems. It is also clear that the second radial conduit does not put in fluid communication the restricted
20 portion of the secondary duct with the external environment.

Disclosure of the invention

A general object of this invention is to obviate the above drawbacks, by providing a
25 cost-effective operating device.

A primary object is to provide a device having a safe and reliable operation, and whose features remain unchanged with time.

30 A particular object is to provide a device whose operating sequence may be easily controlled and changed.

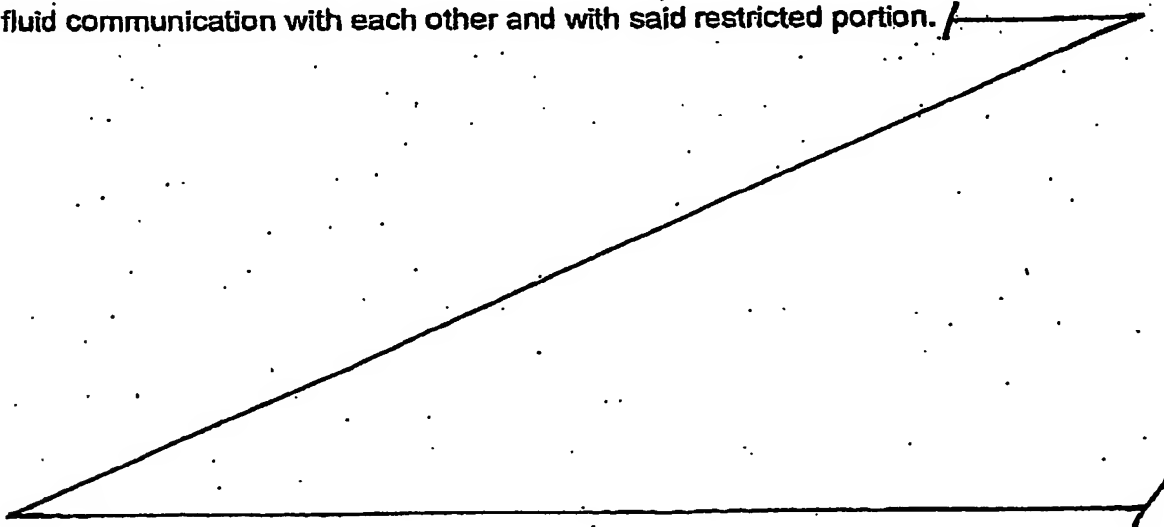
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A further object of the invention is to provide a device that may be controlled by a directly or remotely connected computer, according to a desired program.

Another particular object is to provide a device that can change the motion characteristics of the delivered fluid, particularly allowing the transition from laminar flow into turbulent flow and vice versa.

A further particular object is to provide a device that requires little maintenance and is easily cleanable.

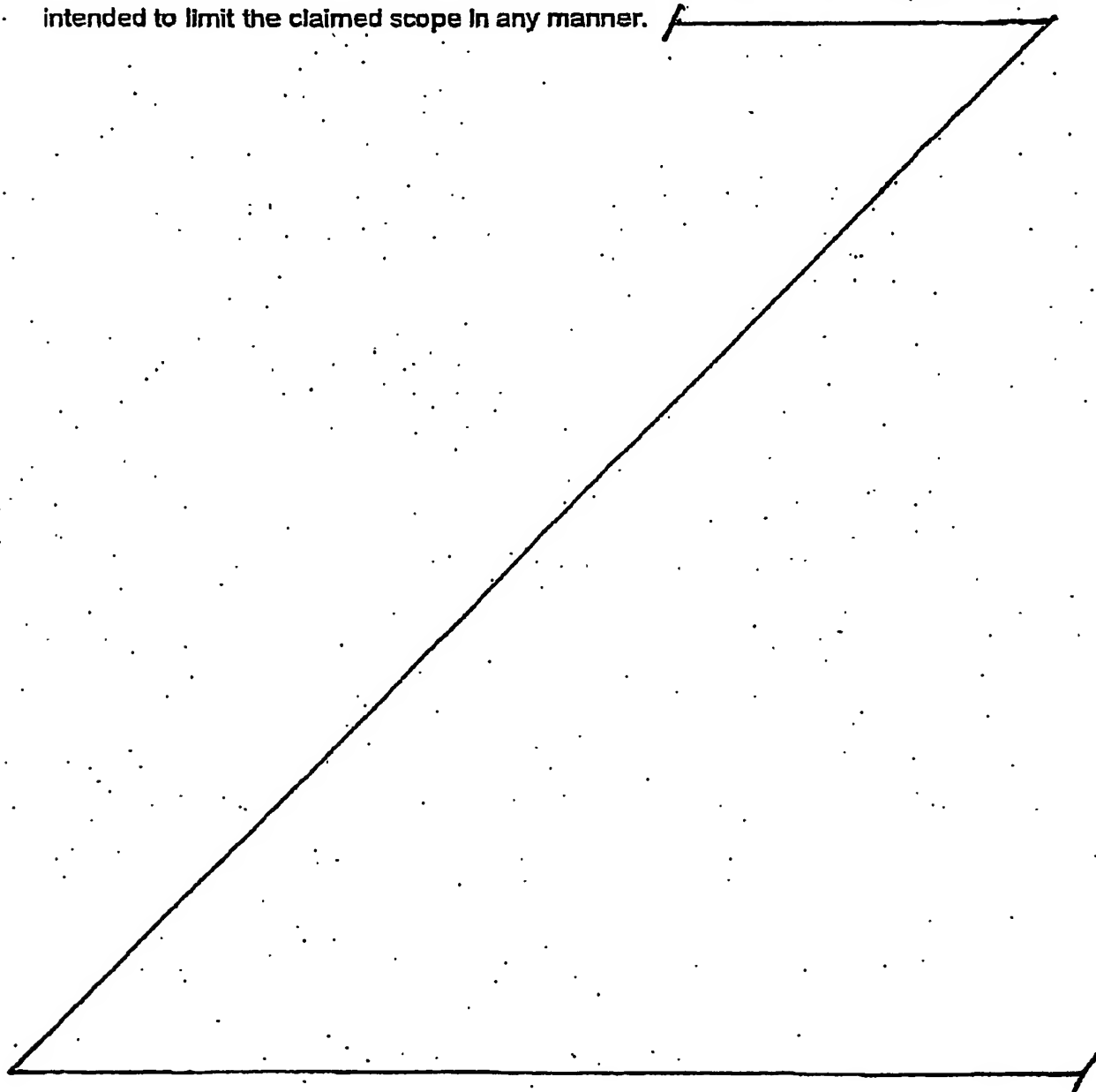
These objects, as well as other objects that will be more apparent hereinafter, are achieved, according to claim 1, by a vacuum generating device comprising a duct extending along a longitudinal axis for the passage of a main pressurized fluid, said longitudinal duct having an inlet portion, an outlet portion and a restricted portion located therebetween and adapted to generate a vacuum by Venturi effect, a first radial conduit in fluid communication with said restricted portion, at least one second radial conduit, in fluid communication with said restricted portion and with the outside, characterized in that said first radial conduit has at least one connecting port for connecting with one or more external actuator members, a central chamber being provided to put said first and said second radial conduits in fluid communication with each other and with said restricted portion.



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materials may vary depending on different needs, without departure from the scope of the invention.

While the device and assembly have been described with particular reference to the accompanying figures, the numerals referred to in the disclosure and claims are only used for the sake of a better intelligibility of the invention and shall not be intended to limit the claimed scope in any manner.



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